(12) UK Patent Application (19) GB (11) 2 197 427 (13) A

(43) Application published 18 May 1988

(21) Application No 8626213

(22) Date of filing 3 Nov 1986

(71) Applicant
Tanashin Denki Co Ltd

(Incorporated in Japan)

2–19–3 Shinmachi, Setagaya-ku, Tokyo 154, Japan

(72) Inventors
Shinsaku Tanaka
Toshio Yoshimura

(74) Agent and/or Address for Service
Graham Watt & Co,
Riverhead, Sevenoaks, Kent TN13 2BN

(51) INT CL⁴
F16C 13/02

(52) Domestic classification (Edition J):
F2U 12
U1S 2016 F2U

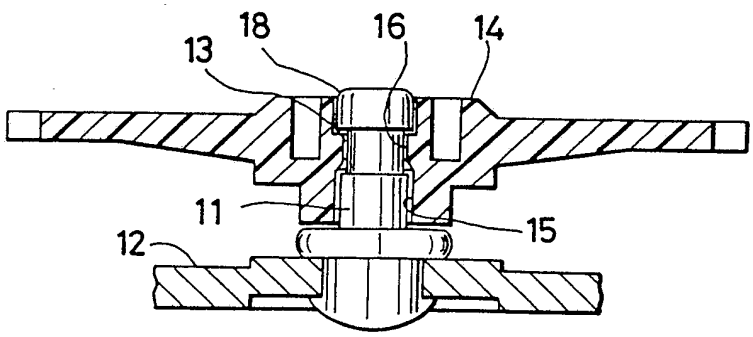
(56) Documents cited
EP 0192387 EP 0180307

(58) Field of search
F2U
Selected US specifications from IPC sub-class F16C

(54) Bearing assembly

(57) A bearing assembly comprises a shaft (11) journalling a gear wheel (14). The bore (15) of the gear wheel has a land portion (16) which is force fitted into an annular recess (13) in the shaft (11). To assist the force fitting step, the land has a tapered surface at one end and the shaft has a rounded edge (18). The gear wheel is composed of synthetic resin. The land may be formed in the shaft and the recess in the bore of the gear if desired. A tapered or curved surface is formed on at least one of the land portion and a part of the shaft or rotatably supported member defining the annular recess, which part is brought into contact with the raised portion upon assembly of the rotatably supporting structure. The rotatably supported member is supported at both sides of the raised portion.

FIG. 1



GB 2 197 427 A

13 NOV. 86- 26213
D F A

2197427

FIG. 1

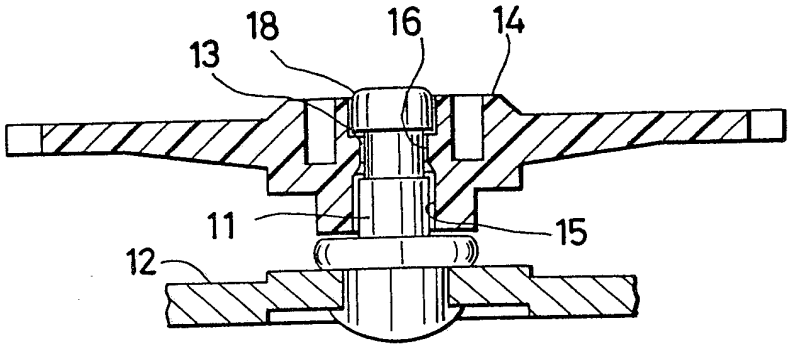


FIG. 2

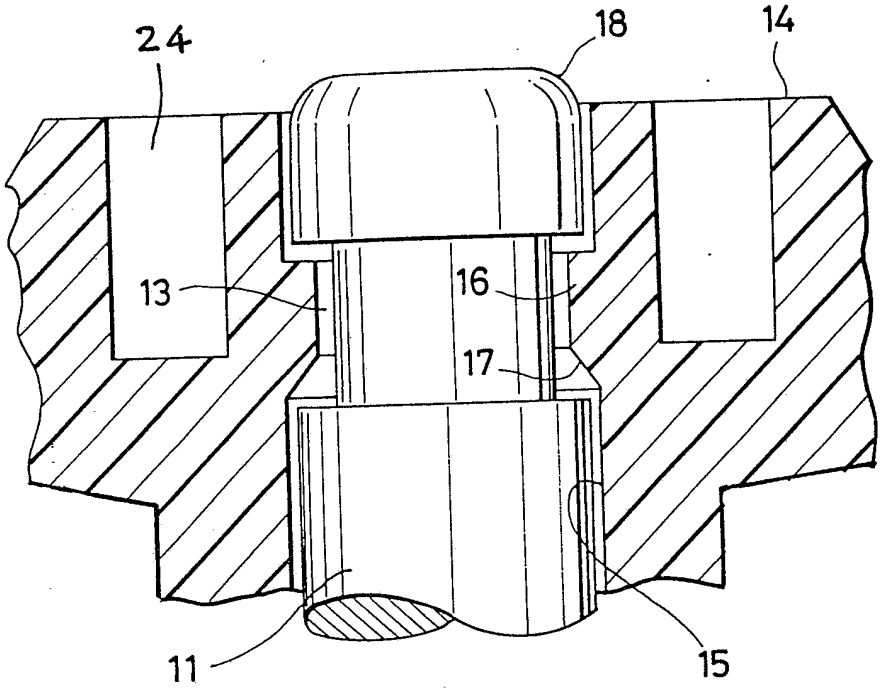


FIG. 3

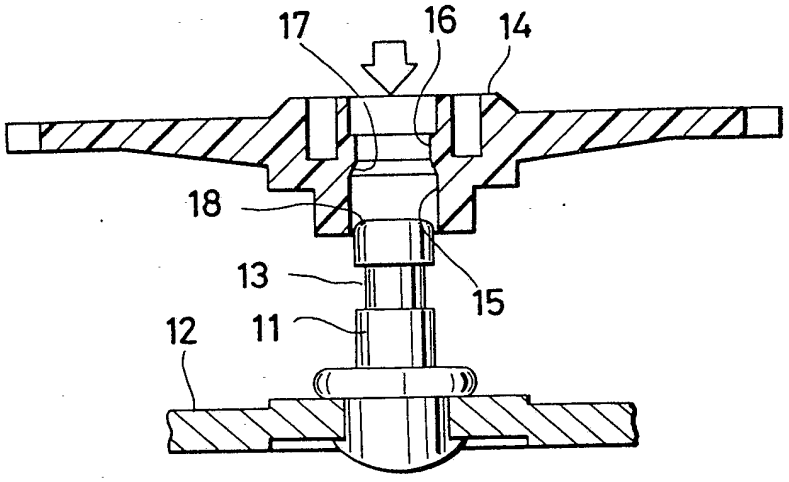


FIG. 4

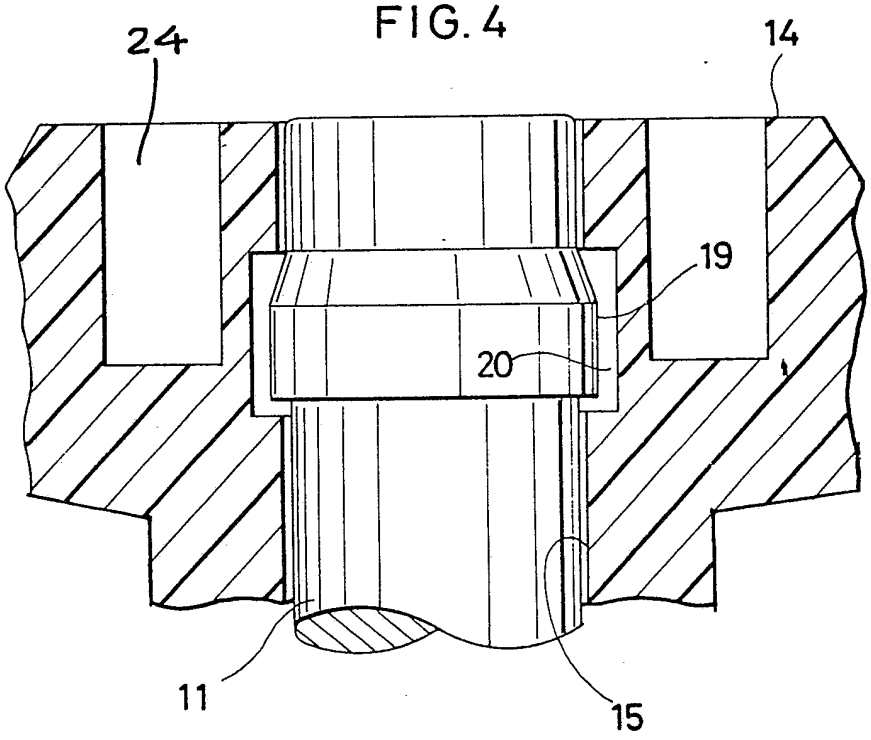


FIG. 5
PRIOR ART

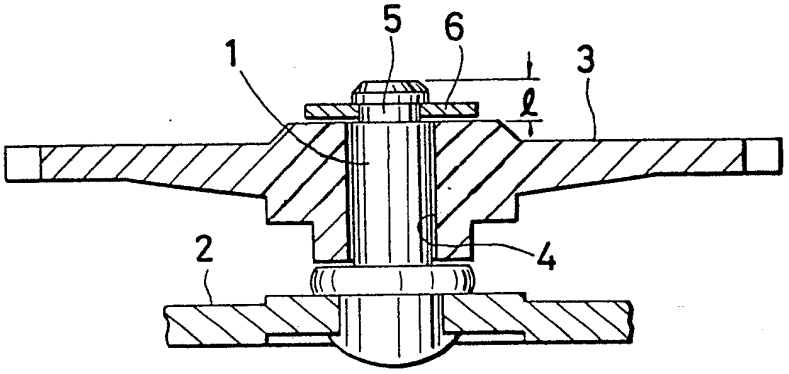
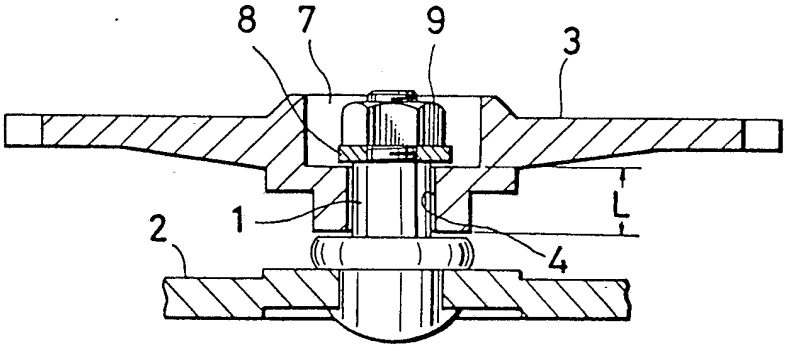


FIG. 6
PRIOR ART



SPECIFICATION

Bearing assembly

BACKGROUND OF THE INVENTION

This invention relates to bearing assemblies, particularly although not exclusively for pulleys or gears and so on which are axially thin.

In order to support a rotary member such as pulley or gear, the general practice is to fix one end of a shaft on a fixed member and after fitting a central bore of a rotary member on the shaft, to fit a circlip in a circumferential groove formed in the free end of the shaft so as to prevent the rotary member from slipping off the shaft.

The general practice described requires two assembly steps, namely, positioning the rotary member on the shaft and then fitting the circlip on the shaft. The drawback is that this structure cannot be efficiently assembled, especially because fitting the circlip is cumbersome.

Furthermore, it is not advantageous from the viewpoint of cost reduction to use small parts like circlips. It has hence been desired to avoid use of such small parts.

In order to fit the circlip the free end of the shaft has to extend from the rotary member by a significant length. This has resulted in an inconvenience in that the length of the shaft cannot be shortened to any significant extent, even if the rotary member is made thinner.

In order to avoid an outward extension of the shaft from the rotary member, it is also known to enlarge the central bore of the rotary member so as to form a large-diametered recess for housing a securing nut and washer. This arrangement, however, leads to a reduction in the journal length by a length equivalent to the depth of the recess, so that the rotary member may not rotate with its axis coincident with the axis of the shaft, in other words, the rotary member may not be rotated accurately.

SUMMARY OF THE INVENTION

With the foregoing in view, the present invention has, as its principal object, the provision of a bearing assembly which may be assembled in one step and hence allows efficient assembly work, can obviate a circlip and can hence realise a cost reduction, and can avoid easily the projection of the shaft from the rotary member without materially reducing the journal length, in other words, while ensuring accurate rotation of the rotary member.

According to this invention, there is thus provided a bearing assembly which comprises a shaft journalling a rotary member, there being a raised portion provided on one of the outer circumferential surface of the shaft, and the inner circumferential surface of a central bore of the rotary member, an annular recess formed in the other of the outer circumferential surface of the shaft and the inner circumferential surface of the rotary member and adapted to receive the raised portion therein; and a tapered or curved surface formed on at least one of the raised portion and a portion of the shaft or of the rotary member defining the annular recess, which portion is brought into contact with the raised portion upon assembly of the bearing; whereby the rotary member is rotatably supported by the shaft on both sides of the raised portion.

With a bearing assembly according to the present invention, it is possible to mount the rotary member rotatably on the shaft in one step. This leads to efficient assembly work, and owing to the obviation of the circlip, a cost reduction is achieved. It is also easy to prevent the shaft from projecting out from the rotary member. Even in such a construction, the supported length of the rotary member, supported rotatably by the shaft, is not substantially reduced and the rotary member is, therefore, assured to rotate accurately.

Specific embodiments of the present invention will now be described by way of example and not by way of limitation with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a cross-sectional view of a bearing assembly according to this invention;

FIGURE 2 is an enlarged fragmentary cross-sectional view of the structure of FIGURE 1;

FIGURE 3 is a view corresponding to Fig. showing the assembly step;

FIGURE 4 is a fragmentary cross-sectional view of an alternative bearing assembly according to this invention;

FIGURE 5 is a cross-sectional view of a known bearing assembly; and

FIGURE 6 is a cross-sectional view of a further known bearing assembly.

DETAILED DESCRIPTION OF THE PRIOR ART

With reference to the accompanying drawings and first to FIGURE 5, one end of a shaft 1 is fixed on a fixed member 2. A rotary gear 3 has a central bore 4 which receives the shaft 1, the shaft extending from the front face of the gear a significant length l and carrying a circlip 6 in a circumferential groove 5 of the shaft.

With reference to FIGURE 6, to avoid an outward extension l of the shaft a recess 7 is formed in the gear to house a securing nut 9 and washer 8. This leads to a reduction in the journal length L.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS OF THE INVENTION

Referring first to FIGURE 1 and FIGURE 2, a first embodiment of this invention will next be described. A shaft 11 is fixed at one end thereof on a fixed part 12 and an annular groove 13 is formed as an annular recess in

the outer circumferential surface of the shaft 11.

On the other hand, an annular land 16 is provided as a raised portion on the wall of a central bore 15 formed through a synthetic resin gear 14 depicted as one example of the rotary member to be supported rotatably. The annular land 16 is received within the annular groove 13. The shoulder portion of the annular land 16, which shoulder portion is located on the side adjacent the fixed end of the shaft 11, is formed with a tapered surface 17. The shaft 11 defines a curved surface (rounded surface) 18 at its free end where the shaft is brought into contact with the annular land 16 of the gear 14 upon their assembly. Accordingly, the gear 14 is rotatably supported at both sides of the annular land 16, in other words, at both sides of the annular groove 13.

The bearing assembly of the above construction can be assembled as shown in FIGURE 3, namely, by bringing the central bore 15 of the gear 14 into registration with the free end of the shaft 11 and then force-fitting the gear 14 axially on the shaft 11 against the elasticity of the material itself of the gear 14. As a consequence, the tapered surface 17 of the annular land 16 is brought into camming contact with the curved surface 18 formed at the free end portion of the shaft 11. As soon as the annular land 16 has passed beyond the upper edge of the annular groove 13 as viewed in FIGURE 2, the annular land 16 springs into the annular groove 13 and is hence received therein so that the assembly is completed. Once the parts have been assembled in the above-described manner, it is no longer possible to pull the gear 14 off the shaft 11 because the annular groove 13 and annular land 16 are maintained in mutual engagement by their opposed shoulder surfaces disposed normal to the journal axis.

It is hence possible to mount the gear 14 on the shaft 11 in a single step (i.e., by a one-touch operation), thereby permitting efficient assembly work and obviating the usual circlip and as a result, materially reducing the manufacturing cost.

It is also feasible with ease to avoid the outward projection of the shaft 11 from the gear 14. This modification does not result in any substantial reduction in the supported length of the gear 14 by the shaft 11. Hence, the gear 14 is still accurately journalled. The above modification is effective particularly when the rotary member, namely, the gear 14, is axially thin.

Reference will next be had to FIGURE 4 which illustrates the alternative embodiment of this invention.

In this embodiment, an annular land 19 is formed on the outer circumferential surface of the shaft 11 while an annular groove 20 is formed in the inner circumferential surface of the central bore 15 of the gear 14. The annular land 19 is received in the annular groove 20. This embodiment can bring about the same advantages as the above-described first embodiment of this invention. In addition, the second embodiment does not require any curved surface at the free end of the shaft 11 because the free end of the shaft 11 is not brought into contact with the annular land 19. The alternative embodiment is, therefore, effective especially when the free end of the shaft 11 is desired not to project out at all from the gear 14 whilst maintaining a good journal length.

Two detailed embodiments of this invention have been described by way of example. It should however be borne in mind that the present invention is not limited to or by them. For example, it is not absolutely necessary to form the raised portion, or land, which is provided on either the outer circumferential surface of the shaft or the inner circumferential surface of the central bore of the rotatably supported member, in an annular configuration. The land could be castellated for example.

To assist in the elastic deformation of the gear during the assembly step in the first specific embodiment described, the gear may be formed with an annular recess 24 surrounding its central bore 15, in the front face of the gear and extending axially to about the radial plane of the radially inner edge of the tapered surface 17. Similarly, in the alternative embodiment, the recess 24 extends to about a mid-radial plane of the land 19, that is to say to a plane beyond the radially outer edge of the tapered surface of the land 19 in the assembled position of the land.

In each case the recess 24 forms a thin walled neck of the gear material which assists in the deformation of the gear material necessary to achieve assembly.

Instead of an annular recess 24, a ring of closely spaced cylindrical recesses 24 could be provided.

Having now fully described the invention, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made thereto without departing from the spirit or scope of the invention as set forth herein.

CLAIMS

1. A bearing assembly comprising a shaft journalling a rotary member, there being a raised portion provided on one of the outer circumferential surface of the shaft, and the inner circumferential surface of a central bore of the rotary member,

an annular recess formed in the other of the outer circumferential surface of the shaft and the inner circumferential surface of the rotary member and adapted to receive the raised portion therein; and

a tapered or curved surface formed on at least one of the raised portion and a portion of the shaft or of the rotary member defining the annular recess, which portion is brought into contact with the raised portion upon assembly of the bearing;

whereby the rotary member is rotatably supported by the shaft on both sides of the raised portion.

2. A bearing assembly as claimed in claim 1, wherein the rotary member is made of a synthetic resin.

3. A bearing assembly as claimed in claim 2, wherein the raised portion is provided on the rotary member made of the synthetic resin.

4. A bearing assembly as claimed in claim 3, wherein the rotary member is recessed to form a thin walled neck of the synthetic resin material surrounding the raised portion or the recess on or in the inner circumferential surface of the central bore of the rotary member.

5. A bearing assembly substantially as hereinbefore described with reference to, and as shown in Figs. 1, 2 and 3 or Fig. 4 of the accompanying drawings.

CLAIMS

Amendments to the claims have been filed, and have the following effect:-

Claim 1 above has been deleted.

New amended claim has been filed as follows:-

1. A bearing assembly comprising a shaft journalling a rotary member having a through bore receiving the shaft, said through bore extending between, and opening in, opposite end faces of the rotary member, there being a raised portion provided on one of the outer circumferential surface of the shaft, and the inner circumferential surface of a central bore of the rotary member,

an annular recess formed in the other of the outer circumferential surface of the shaft and the inner circumferential surface of the rotary member and adapted to receive the raised portion therein; and

a tapered or curved surface formed on at least one of the raised portion and a portion of the shaft or of the rotary member defining the annular recess, which portion is brought into contact with the raised portion upon assembly of the bearing;

whereby the rotary member is rotatably supported by the shaft on both sides of the raised portion in regions extending to said opposite end faces of the rotary member.

Published 1988 at The Patent Office, State House, 66/71 High Holborn, London WC1R 4TP. Further copies may be obtained from The Patent Office, Sales Branch, St Mary Cray, Orpington, Kent BR5 3RD. Printed by Burgess & Son (Abingdon) Ltd. Con. 1/87.

PUB-NO: GB002197427A

DOCUMENT-IDENTIFIER: GB 2197427 A

TITLE: Bearing assembly

PUBN-DATE: May 18, 1988

INVENTOR-INFORMATION:

NAME	COUNTRY
TANAKA, SHINSAKU	N/A
YOSHIMURA, TOSHIO	N/A

ASSIGNEE-INFORMATION:

NAME	COUNTRY
TANASHIN DENKI CO	N/A

APPL-NO: GB08626213

APPL-DATE: November 3, 1986

PRIORITY-DATA: GB08626213A (November 3, 1986)

INT-CL (IPC): F16C013/02

EUR-CL (EPC): F16C017/10 , F16C033/20 , F16H057/02

US-CL-CURRENT: 384/129

ABSTRACT:

CHG DATE=19990617 STATUS=O> A bearing assembly

comprises a shaft (11) journalling a gear wheel (14). The bore (15) of the gear wheel has a land portion (16) which is force fitted into an annular recess (13) in the shaft (11). To assist the force fitting step, the land has a tapered surface at one end and the shaft has a rounded edge (18). The gear wheel is composed of synthetic resin. The land may be formed in the shaft and the recess in the bore of the gear if desired. A tapered or curved surface is formed on at least one of the land portion and a part of the shaft or rotatably supported member defining the annular recess, which part is brought into contact with the raised portion upon assembly of the rotatably supporting structure. The rotatably supported member is supported at both sides of the raised portion. □